User Manual

Year: 2015 **Semester:** Spring **Team:** 1 **Project:** Twitch Plays ECE477
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1.0 Product Description

A highly scalable educational tool for students and enthusiasts of all ages, *Twitch Plays Robot Soccer* is a game that everyone can enjoy! All you need is an internet connection, a power outlet, and at least 2 players with computers to enjoy this collaborative robotics experience!

In *Twitch Plays Robot Soccer,* participants connect to a robot stream via Twitch.tv, a live video streaming website to observe and control the robots as they play a game of soccer. They do this by typing pre-defined commands into the chat window which are received and executed by the robots. The best part is that there is no limit on the amount of players that can play as long as each one has a device that can access the internet!

This product is great for exercises in teamwork or simply as entertainment. The beauty of the design is that robots can be easily added or removed with ease allowing the game to quickly scale. In addition to the flexibility provided by the robots, the field packaged with the product is a base model (4” x 4”). Any field with a grounded floor plane and 12v VDD plane roughly 12” above the ground plane will work. This means that you can start with the base design, or create your own. A more complicated field layout could turn a soccer game into a racetrack or more with ease.

2.0 Product Illustrations

2.1 Robot Drawings

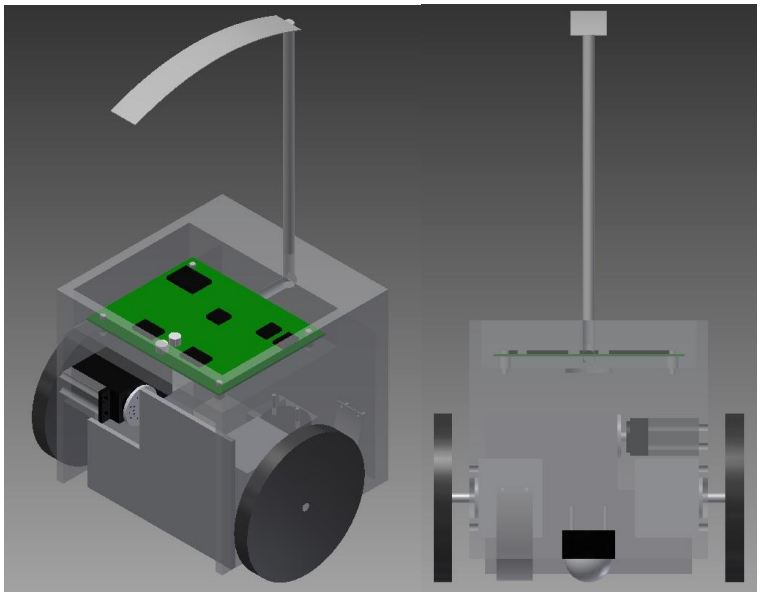

Figure 2.1.1: These are CAD illustrations of the assembled robot: isometric (left) and rear (right). The circuit board is nested and there is an antenna projecting from the top that maintains contact with the aluminum mesh on the lid to receive power.

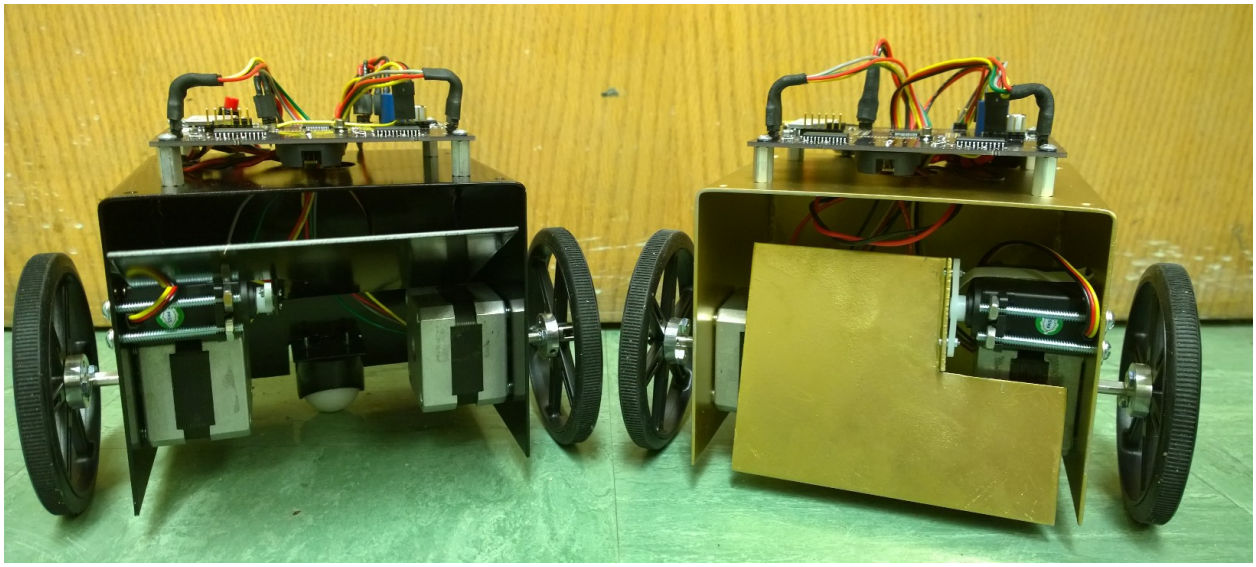

Figure 2.1.2: This is the front view of both robots with circuit boards attached. The gold robot has its paddle and the servo that runs it clearly visible. The black robot has both wheel motors clearly visible inside the chassis.

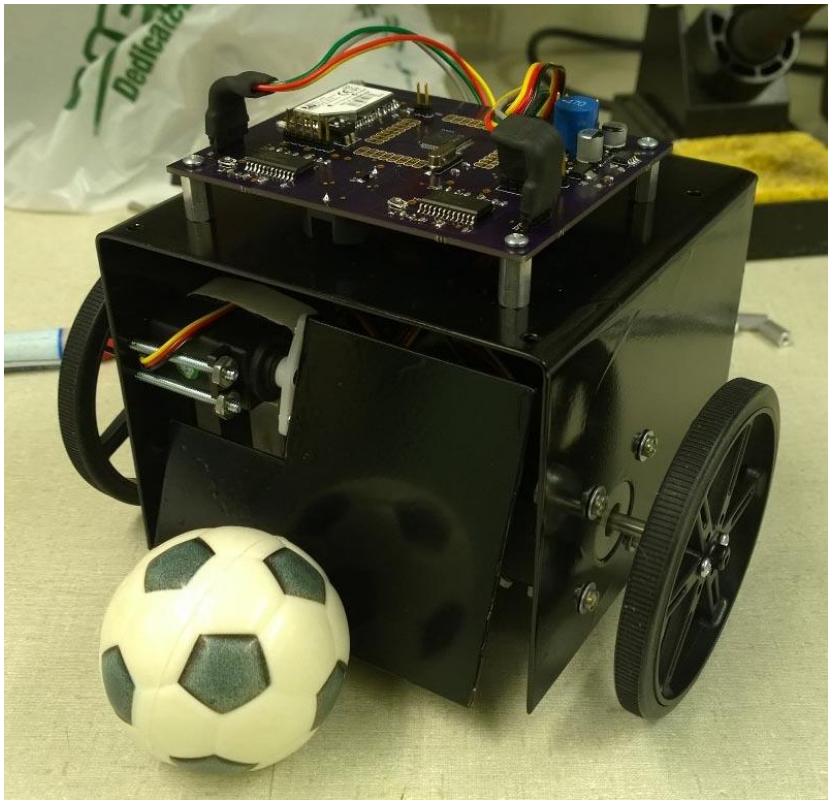

Figure 2.1.3: This is the assembled robot with a game ball for scale. This photograph shows the motor connectors and the individual components on the PCB. The final product will have a covering for the circuit board that has the antenna attached as mentioned in the description of Figure 2.1.1.

2.2 Enclosure

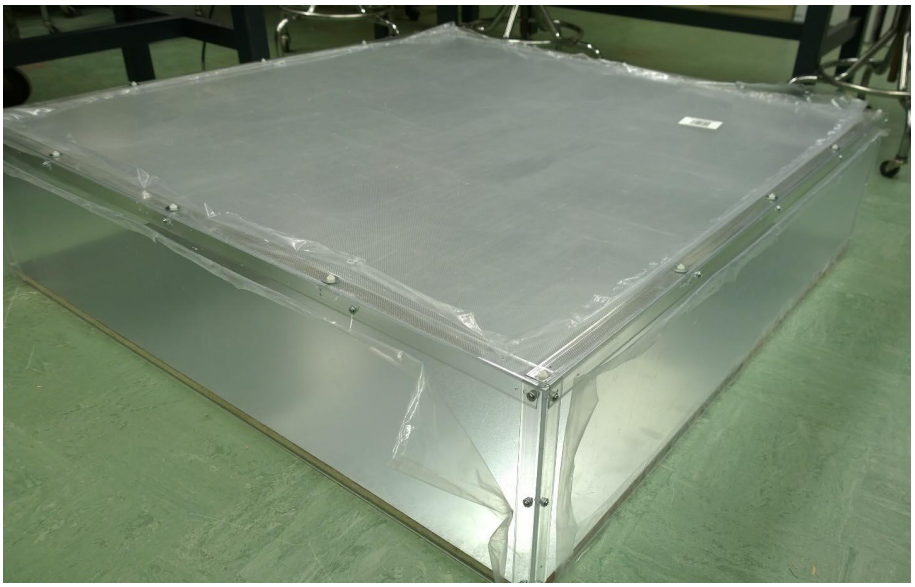

Figure 2.2.1: This is the assembled playing field. There is aluminum mesh attached to the top of the plastic enclosure and stainless steel sheet attached to a piece of wood on the bottom to serve as the ground. There is an opaque covering on the enclosure to prevent dust. The lid, which includes the top and the side walls, is removable.

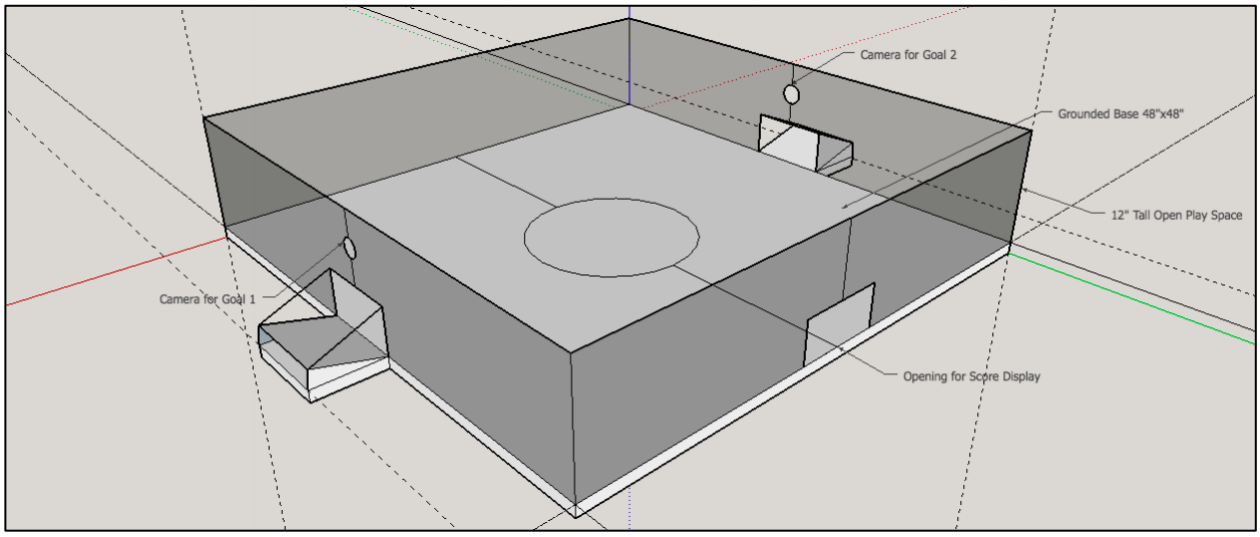

Figure 2.1.2: This is the diagram of the playing field with the goals attached. The specific score display attached to the physical game depends on the model ordered. The base model does not include a physical display, and instead requires the user to attach their own display to the included HDMI port if a display is desired. Score can be found live at any time through the associated Twitch feed.

2.3 Twitch Stream

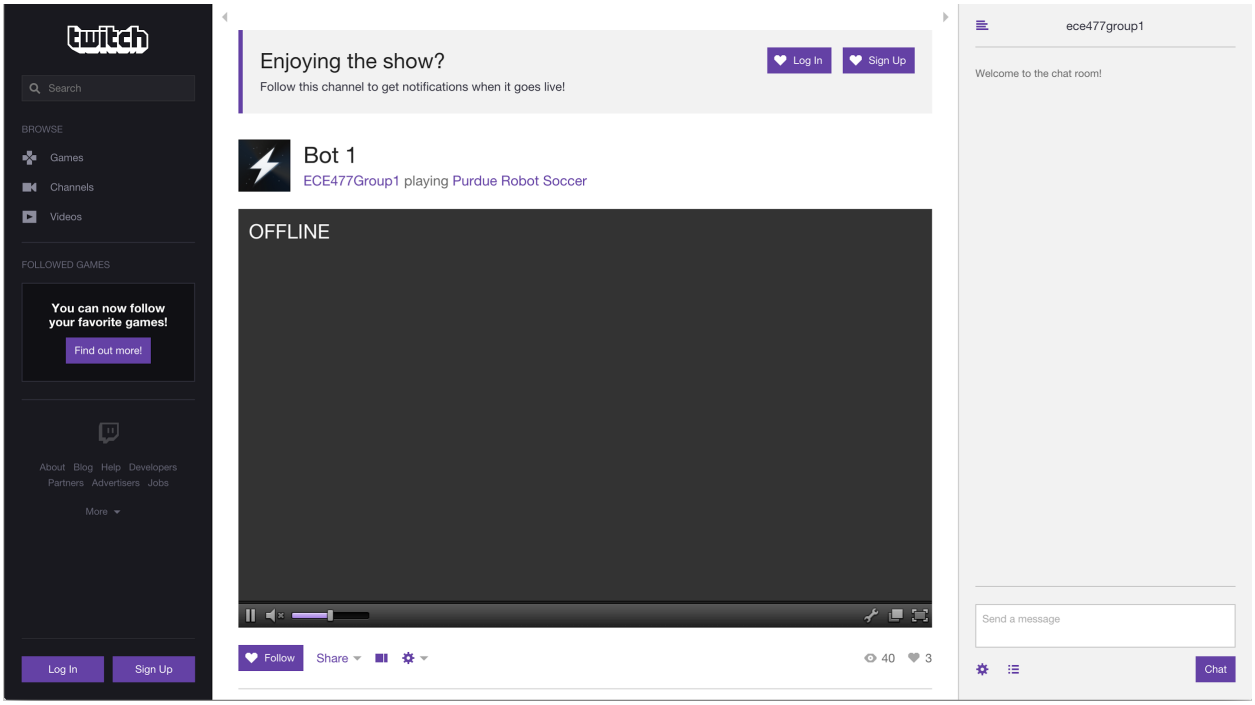

Figure 2.3.1: This is a screenshot of the Twitch stream for the robot with id '1'. This was taken from http://www.twitch.tv/ece477group1. The stream for robot 2 can be found at http://www.twitch.tv/ece477group1_2. In the center, there is a screen that will display video feeds from the arena and a score box. On the right, users can input chat messages that will be sent as commands to the robot. The specific URL of the Twitch page that your product uses will be based on the settings that are selected during the installation. (See Section 3.2)

3.0.0 Setup Instructions

Follow the order shown in section 3.0b. Each step is further explained below. Step 1 is shown in 3.1, step 2 in 3.2 and so on. Please consult the end of this document for troubleshooting assistance

3.0.1 Setup Order

1. Configure Router
2. Install/Configure Webserver
3. Setup Enclosure
4. Configure Robots
5. Configure Twitch Streams
6. Announce Active Game
7. Attach Score Display (Optional)

3.1 Configure Router

Currently, the robots and field look for a local WiFi network with the following information:

ssid: steelmesh
pass: wittytrain
security: wpa2

It is essential that that connection information is used as the robots, and field all search for that network. You cannot configure an alternative network at this time, as this system depends on dedicated IP addresses and they need to be available.

3.2 Install/Configure Webserver

1. Install ruby 2.1.2
2. Download *Twitch Plays Robot Soccer* application from github.com/Tornquist/steelmesh
3. Run 'bundle install' from the application directory
4. Install redis
5. Create a file called '.env' in the root application folder with the following contents:
   TWITCH_USER=[TWITCH USER NAME HERE]
   TWITCH_PW=[TWITCH_OATH ID]
6. Change line 16 of lib/tasks/steelmesh.rake to the desired list of channels to monitor on Twitch (May require creating a Twitch account for each robot stream)
7. Change line 33 of lib/tasks/twitch_helper.rb to include the desired channel of bot 1.
8. Acquire the local ip 192.168.1.7
9. Start the redis server: 'redis-server'
10. Start the twitch irc bot: 'rake steelmesh:irc_bot'
11. Start the rails server with: 'rails s -b 192.168.1.7'

3.3 Setup Enclosure

1. Plug in a keyboard and mouse to the exposed usb ports
2. Connect local display screen with exposed hdmi plug
3. Connect all three plugs to 120v wall power.
4. Log in on the screen with user: pi and pass: raspberry
5. Open up a gui with ‘startx’
6. Open a terminal.
7. Navigate to the pi user folder and start the field monitoring with ‘sudo python score_monitor.py’
8. Open up an internet browser
9. Navigate to 192.168.1.7:3000/scores
10. Resize window to display in an acceptable manner

3.4 Configure Robots

1. Set the on chip DIP switches to the appropriate device ID. (Consult the previous section for the acceptable IDs for each paddle type.)
2. Place the robot on the field.
3. Adjust power wiring to make sure there is firm contact with the ground and power plane.
4. Turn robot on.

3.5 Configure Twitch Streams

1. Use the accounts created for the channels the webserver was configured for.
2. Obtain the stream keys for each account.
3. Install a broadcasting software for your webserver OS. OBS is recommended for OSX.
4. Open 192.168.1.7:3000/streams/field in a browser
5. Open 192.1681.7:3000/scores in a browser
6. Configure the software to share the webcam streams and the score data to each appropriate twitch feed.

3.6 Validate System

1. With all systems running, type a command in twitch irc feed (commands listed below)
2. Watch rake logs for the irc bot to identify the command
   --If successful, the irc_bot is working
3. Watch server logs for request for command
   --If successful, the robot WiFi is working properly
4. Monitor the robot
   --If successful the robot is working
5. Press each score button and validate that the score changes
6. Press the reset score button

3.6 Announce Active Game

Post the links to the Twitch pages on your company website so that users can interact with the Twitch system.

3.7 Attach Score Display (Optional)

1. Connect a monitor to the field using the available HDMI port.
2. Connect a keyboard and mouse to the available USB ports
3. Restart the field
4. Log in with the username: pi and password: raspberry
5. Open the included internet browser
6. Navigate to 192.168.1.7:3000/scores

4.0 Usage Instructions

4.1 Normal Usage

1. Type commands into the Twitch chat stream.
2. Each robot will get the next command from the queue and execute it.

4.2 Gameplay Commands

These commands can be entered in the Twitch.TV chat feed associated with each robot. Each organization needs to set it's own Twitch login and channel name. On the chat feed for a given channel, the following commands will be sent to the robot. Everything else said will be displayed to other users online, but will not be sent to the robot.

Goal	**Command**
Move forward	!forward
Move back	!back
Turn left	!left
Turn right	!right
Use the paddle to kick the ball	!kick
No operation	!nop

4.3 Updating the Webserver Software

1. Close the rails server
2. Close the irc_bot
3. Close the redis server
4. Run git pull from the main application directory
5. Run bundle update
6. Start the irc_bot
7. Start the webserver and bind to 192.1681.7
8. Start redis
9. Refresh all webpages used for streaming.

4.4 Scoring

The score for each team will update when a ball goes into the goal and hits the button. The score resets to zero when it hits ten. To reset the score, press the button on the enclosure labeled "Reset Score".

4.5 Changing Settings

There are no settings for this product that can be configured during normal usage.

To change robot ID:

1. Power off the system
2. Power off robots
3. Remove backup battery
4. Remove protective PCB covering
5. Change DIP switches
6. Replace PCB covering
7. Replace backup battery
8. Power on robots (and place on field)
9. Power up the field

5.0 Troubleshooting Instructions

If you have any problems or questions that are not covered in this document, please contact our help line at 765-555-1337 or find the contact information of our team at https://engineering.purdue.edu/477grp1/.

Problem: The robot is not connected to the network.
Solution: Power off the grid, turn off the robot power, remove the backup battery. Replace battery, turn on robot power, power grid back on. (For the other working robots, leave in place. The backup battery should keep settings consistent.)

Problem: The irc_bot rake task will not connect to twitch. (IE: No commands coming in)
Solution: The twitch credentials are old.

1. Update twitch passwords
2. Update the .env file with the new oath password acquired from twitch apps (http://twitchapps.com/tmi/)
3. Close and restart all webserver applications.
4. If twitch continues to fail to connect, make sure all irc channels listed in the source (described in the configuration section) are lower case starting with a #
5. If twitch continues to fail to connect, make sure the site is online
6. If problems continue, contact the distributor of *Twitch Plays Robot Soccer*

Problem: Unable to stream twitch channel
Solution: Update twitch channel key from twitch.tv and retry. Update streaming software.

Problem: Cannot connect to webserver
Solution: Make sure the webserver is given the ip address 192.168.1.7 and that the rails server is running with the flag '-b 192.168.1.7'

Problem: Feed frozen on web feed
Solution: Refresh the feed web page locally. If the problem persists, restart the field raspberry pi and refresh the page again. (Remember, restarting the field requires reopening the score display)

Problem: The robot or enclosure breaks under normal usage.
Solution: This product is covered by a 1-year, 1000-mile limited warranty. Please contact our help line at 765-555-1337 to receive information about returning or repairing your product.